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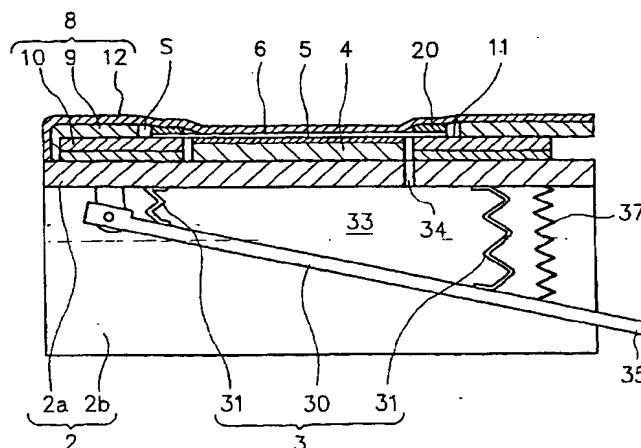
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(54) **Pressure type stencil printing machine**

(57) A stencil printing machine includes a main body (2); a covering openably attached to a surface of the main body (2) and enclosing a space between the main body (2) and the covering (8) for storing a printing sheet and a stencil sheet therein; a flexible sheet (12) attached to the covering so as to face the stencil sheet; pressure

reducing device disposed under the main body (2) so as to communicate with the space and reducing pressure in the space; and manual operating device for operating the pressure reducing device when being pressed downwardly from an operation start position that is substantially in the same level as the covering.

FIG. 5



sheet, and the other one of the upper surface of the frame and a lower surface of the flexible sheet is made from a resin sheet having a smooth surface.

[0010] According to a stencil printing machine as defined in the sixth aspect of the present invention, in the stencil printing machine of the second aspect, the pressure reducing means comprises a swingable bottom plate pivotally attached to a lower surface of the main body at a rear end thereof and an extensible flexible bag disposed between an upper surface of the bottom plate and the lower surface of the main body; the manual operating means is a front end portion of the bottom plate; and the stencil printing machine further comprises return means for setting the bottom plate in the operation start position by urging the bottom plate upward.

[0011] According to a stencil printing machine as defined in the seventh aspect of the present invention, in the stencil printing machine of the second aspect, the pressure reducing means comprises an upper plate disposed on the main body, a vertically extendable flexible bag disposed on a lower surface of the upper plate, a bottom plate disposed on a lower side of the bag and an engaging portion disposed on the bottom plate; and the manual operating means is a manual operating lever pivotally attached to a side surface of the main body to be vertically swingable to engage an upper side of the engaging portion; and return means for setting the manual operating lever in the operation start position by urging the bottom plate upward.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012]

FIG. 1 is a perspective view of a stencil printing machine in the first embodiment of the present invention;

FIG. 2 is a sectional view taken along lines I - I of FIG. 1;

FIG. 3 is a perspective view illustrating a state of opening a flexible sheet in the stencil printing machine of the first embodiment;

FIG. 4 is a perspective view illustrating a state of opening a cover body in the stencil printing machine of the first embodiment;

FIG. 5 is a sectional view similar to FIG. 1, but illustrating a state of reducing pressure in a pressure reduction chamber of the stencil printing machine of the first embodiment;

FIG. 6 is a graph showing a relation between pressure in the pressure reduction chamber and operating time for the reduction;

FIG. 7 is the curve II in the graph of FIG. 6 with the time base extended;

FIG. 8 is a sectional view of a stencil printing machine in the second embodiment of the present invention;

FIG. 9 is a side view illustrating a printing operation

in the stencil printing machine of the second embodiment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0013] FIG. 1 is a perspective view of a stencil printing machine 1 in the first embodiment of the present invention. FIG. 2 is a sectional view taken along lines I - I of FIG. 1. A main body 2 includes a horizontal plate portion 2a and a pair of vertical support portions 2b, 2b. Namely, the support portions 2b, 2b support the plate portion 2a, thereby leaving a space between a ground plane and a lower surface of the plate portion. In the space under the plate portion 2a, an air pump 3 as pressure reducing means is disposed. The air pump 3 will be explained later. On the center of an upper surface of the plate portion 2a, a mounting base 4 is disposed for mounting a printing sheet thereon. The mounting base 4 is composed of elastic material such as sponge. An upper surface of the mounting base 4 is a plane of A4 size, which is appropriate for receiving a sheet-body to be printed such as a paper, a plastic sheet and so on. On the upper surface of the mounting base 4, an adhesive layer 5 is formed for holding a printing sheet 6 as a printing body thereon. As shown in FIG. 2, a frame member 7 is disposed on the upper surface of the main body 2. The frame member 7 surrounds the mounting base 4 at a predetermined gap.

[0014] A cover body 8 is openably attached to the upper surface of the main body 2. As shown in FIG. 2, the cover body 8 is a layered product that is composed of an upper first frame 9 and a second frame 10 on the main body 2 side laminated with each other. A rectangular opening 9a of the first frame 9 is larger than a rectangular opening 10a of the second frame 10 on the main body 2 side. Accordingly, from a viewpoint on an upper side of the cover body 8, an inner peripheral edge of the second frame 10 protrudes inside the opening 9a of the first frame 9, thereby functioning as a shoulder portion 11 for holding a stencil sheet therein. An inner shape of the rectangular opening 9a of the first frame 9 conforms to an outer shape of the stencil sheet for stencil printing.

[0015] The second frame 10 is composed of a flexible magnetic sheet. The frame member 7 is made from ferromagnetic material. When the cover body 8 is laid on the main body 2, the cover body is closely contacted with the main body; so that there is not much clearance left between them for air leakage.

[0016] A flexible sheet 12 is superimposed on an upper surface side of the cover body 8. The cover body 8 including the flexible sheet 12 is swingable relative to the plate portion 2a while being connected to an edge of the plate portion 2a. Further, the flexible sheet 12 can open the first frame 9. When the flexible sheet 12 is swung upward and separated from the first frame 9, the stencil sheet for stencil printing can be placed on the

[0026] Next, printing operation is conducted. The cover body 8 is swung downward and superimposed on the main body 2. Then, the cover body 8 is in the state as shown in FIG. 1 and FIG. 2; however, the stencil sheet assembly 20 is not illustrated in FIG. 2. Next, as shown in FIG. 5, the manual operating lever 35 is pressed downward. The bag 31 extends and the inner space 33 enlarges. Air in the pressure reduction chamber S is transferred to the inner space 33, and pressure in the pressure reduction chamber S is reduced. The flexible sheet 12 is warped by atmospheric pressure, thereby pressing the stencil sheet assembly 20. Ink is pressed and transferred to the printing sheet through the perforations of the stencil sheet 22. Printing is thus conducted.

[0027] After printing, the manual operating lever 35 (the bottom plate 30) is released. The manual operating lever 35 (the bottom plate 30) is swung upward by the return spring 37 and return to the operation start position. The deformed bag 31 shrinks. Air in the inner space 33 returns to the pressure reduction chamber S through connecting hole 34. After the cover body 8 opens, the printing sheet is taken out.

[0028] When ink must be supplied after conducting printing many times, the stencil sheet assembly 20 is taken out of the frame after the flexible sheet 12 is opened, as shown in FIG. 3, and then ink is supplied thereto.

[0029] Ink used here is preferably printing ink of emulsion type described in Japanese Patent Publication No. 54-23601. The ink has viscosity of under 32 degrees on the spread meter at one-minute value; therefore, it is capable of self-holding its shape. Further, the ink may have thixotropy.

[0030] The present machine is so designed that only one stroke of the manual operating lever 35 can attain a necessary pressure reduction in the pressure reduction chamber S on main body 2 side. Namely, the air pump 3 is so constituted that stroke volume thereof exceeds that of the pressure reduction chamber S. Thus, in the case where a necessary pressure reduction is attained by only one stroke of the manual operating lever 35, the pressure reduction is presumed to be conducted instantaneously with velocity, so that a clear print-image is attained in a short operating time in contrast to a print-image by vacuum pump sucking.

[0031] Now, FIG. 6 shows a graph showing a relation between pressure in the pressure reduction chamber S and operating time for the reduction. The curve III is the case where the pressure reduction means in the printing machine 1 of the present invention is replaced with a conventional vacuum pump. The curve II is the case where the printing machine 1 of the present invention functions. FIG. 7 shows the curve III in the graph of FIG. 6 with the time base extended. FIG. 6 clearly shows that the pressure reduction printing machine 1 of the present invention requires less time than the case of adopting the conventional vacuum pump to reduce pressure to a

certain level in the pressure reduction chamber S. The lower is pressure in the pressure reduction chamber S, the higher is the printing density attained. Printing ink does not flow excessively since reduction pressure lasts only for a short time, so that printed material of high quality with less bleeding can be attained.

[0032] FIG. 8 is a sectional view of a pressure reduction printing machine 50 in the second embodiment of the present invention. FIG. 9 is an illustration of a printing operation by the pressure reduction printing machine 50. Thereinafter, different parts from the first embodiment will be mainly explained. For simplifying the description, the same part as that of the first embodiment will be referred to by the same number as that of the first embodiment, and the explanation thereof will be omitted.

[0033] A main body 51 is a hollow box. A cover body 52 is pivotally attached on an upper surface of the main body 51 through a hinge 53. The cover body 52 is a frame having an opening 54 in the center thereof. A frame member 55 is disposed under a lower surface of the cover body 52. The frame member 55 protrudes inward the opening 54. A stencil sheet assembly 25 is disposed inside the opening 54. The stencil sheet assembly 25 includes the frame 21 and the stencil sheet 22. The stencil sheet assembly 25 is placed on the frame member 55. The frame member 55 comes in close contact with the frame member 7 when the cover body 52 is superimposed on the main body 51.

[0034] An ink supply unit 56 is detachably attached inside the opening 54. The ink supply unit 56 includes a base 57 in a frame-form, ink 58 placed in the center and a flexible sheet 59 covering the surface of the ink 58. The numeral 60 shows a cover. The ink supply unit 56 is secured inside the opening 54 by a securing device 61. The ink supply unit 56 can be exchanged according to types and colors of the ink required.

[0035] An air pump 70 is disposed inside the main body 51. The air pump 70 has a box 71 inside the main body 51. A flexible bag 73 is disposed under a lower surface of an upper plate 72 of the box 71. The bag 73 has a bottom plate 74. The bottom plate 74 has a plate portion 74a outside the bag 73. The plate portion 74a is disposed on both ends of the bag 73 in a direction of the hinge 53. Each plate portion 74a includes an engaging portion 75 of a roller shape. Between the each plate portion 74a and a bottom plate of the main body 51, a return spring 76 is disposed as return means. As shown in FIG. 8, when a force does not act downward to the bottom plate 74, the return spring 76 supports the bottom plate 74 in a horizontal position. At the time, an inner space 100 of the bag 73 is the smallest in volume.

[0036] The inner space 100 of the bag 73 is connected to the pressure reduction chamber S through a flexible pipe 80.

[0037] As shown in FIG. 9, a pair of manual operating levers 90, 90 is disposed on both sides of the main body 51 in the direction of the hinge 53. Rear ends of the pair

4. A stencil printing machine as defined in claim 3, wherein said frame comprises an upper first frame having a first opening and a lower second frame disposed under said upper first frame and having a second opening, said second opening being smaller than said first opening and located inside said first opening;

said flexible sheet is openably attached to an upper surface of said first frame in such a manner that said flexible sheet closes said first opening when printing is conducted;

said stencil sheet is a stencil sheet assembly comprising a frame having an outer shape fitting in said first opening, a stencil sheet attached to one face of said frame and a cover sheet openably attached to the other face of said frame; and

said stencil sheet assembly is mounted inside said first opening so that said stencil sheet is located at the bottom when printing is conducted.

5. A stencil printing machine as defined in claim 3, wherein an elastic adhesive layer is disposed on either one of said upper surface of said frame and a lower surface of said flexible sheet, and the other one of said upper surface of said frame and a lower surface of said flexible sheet is made from a resin sheet having a smooth surface.

6. A stencil printing machine as defined in claim 2, wherein said pressure reducing means comprises a swingable bottom plate pivotally attached to a lower surface of said main body at a rear end thereof and an extensible flexible bag disposed between an upper surface of said bottom plate and said lower surface of said main body;

said manual operating means is a front end portion of said bottom plate; and

said stencil printing machine further comprising return means for setting said bottom plate in said operation start position by urging said bottom plate upward.

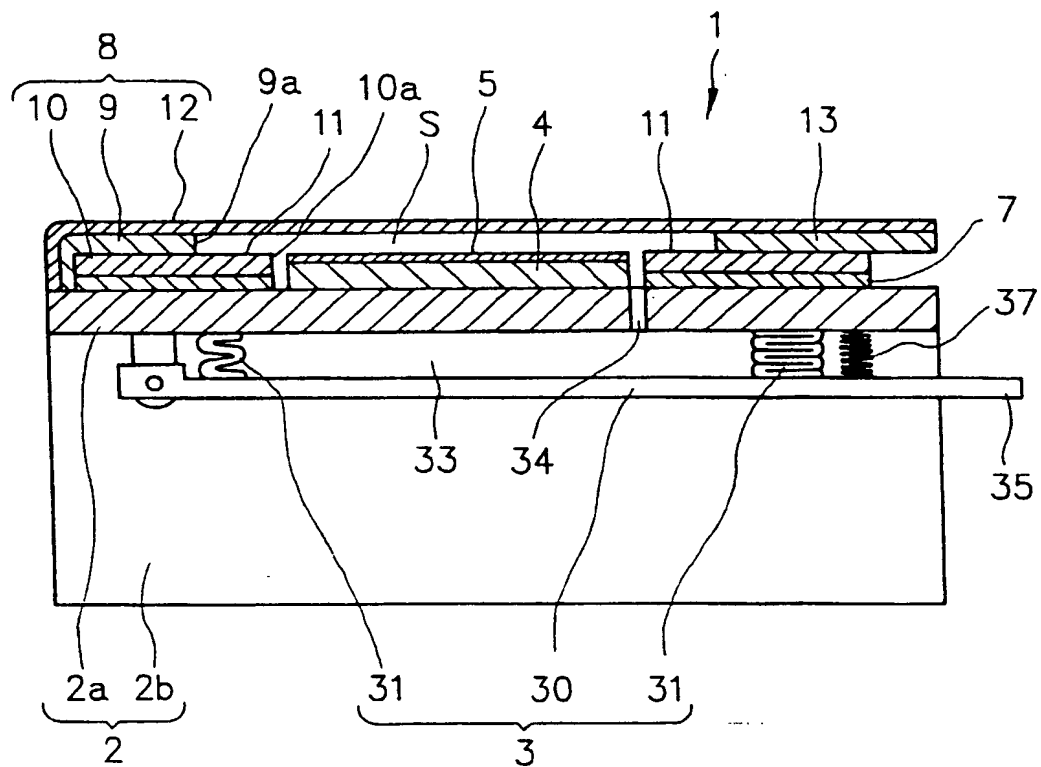
7. A stencil printing machine as defined in claim 2, wherein said pressure reducing means comprises an upper plate disposed on said main body, a vertically extendable flexible bag disposed on a lower surface of said upper plate, a bottom plate disposed on a lower side of said bag and an engaging portion disposed on said bottom plate;

said manual operating means is a manual operating lever pivotally attached to a side surface of said main body to be vertically swingable to engage an upper side of said engaging portion;

and

return means for setting said manual operating lever in said operation start position by urging said bottom plate upward.

FIG. 2



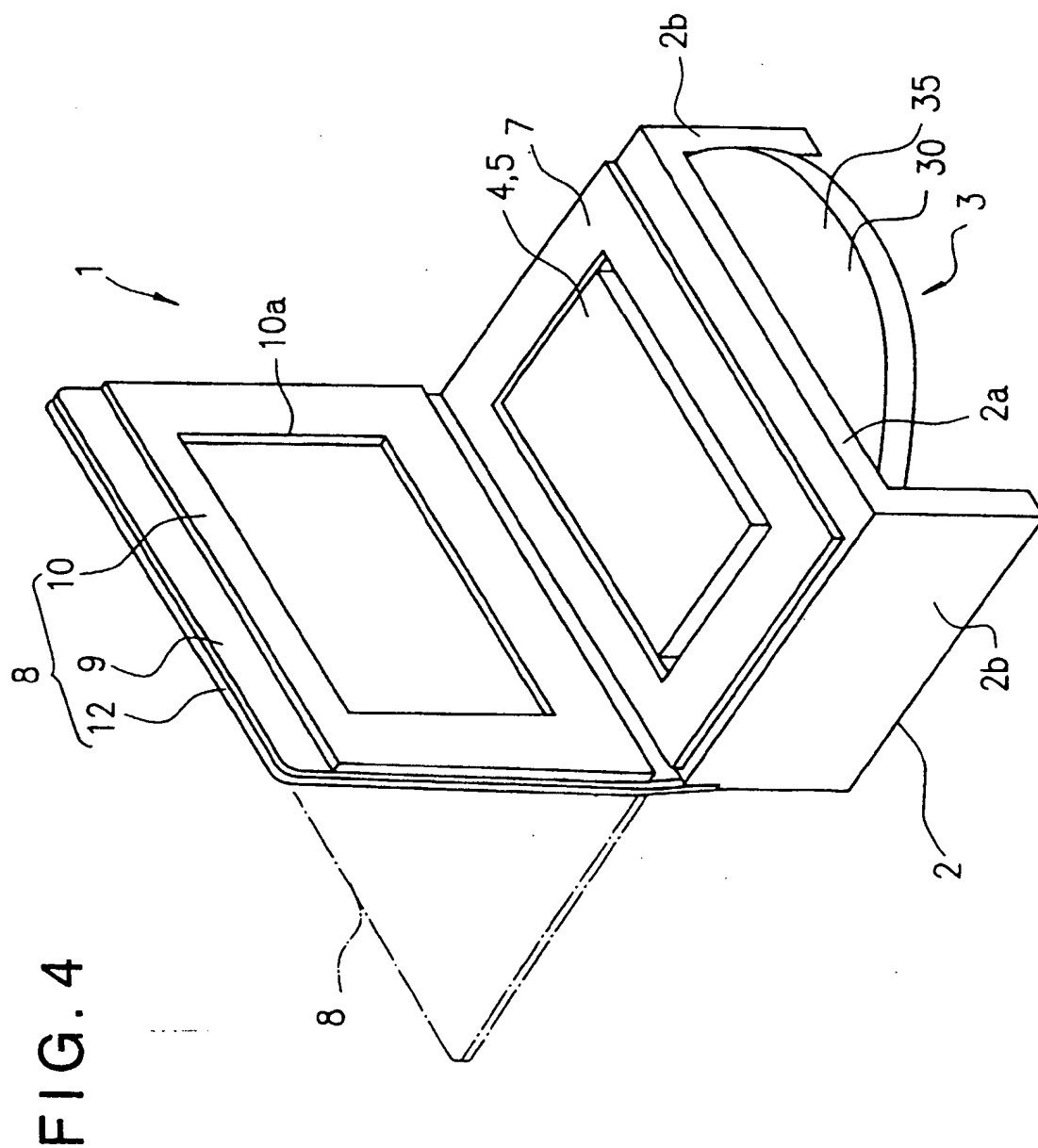


FIG. 4

FIG. 6

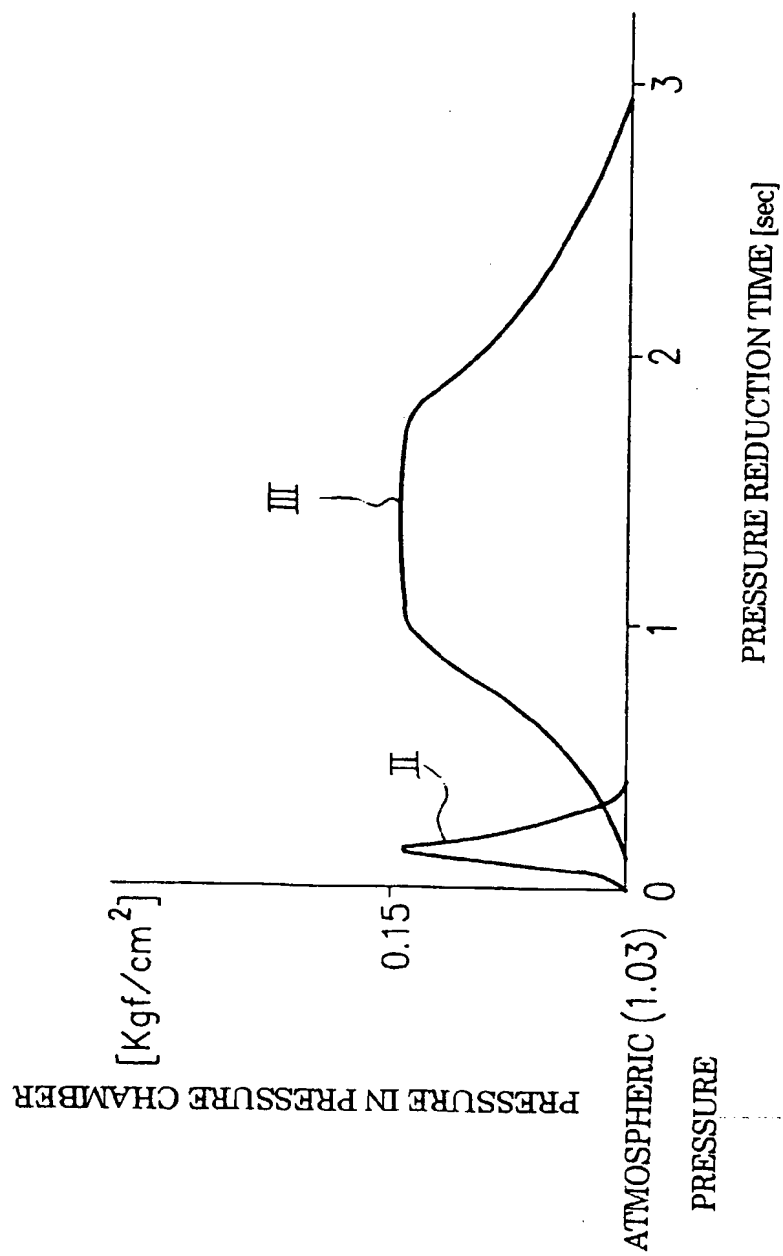
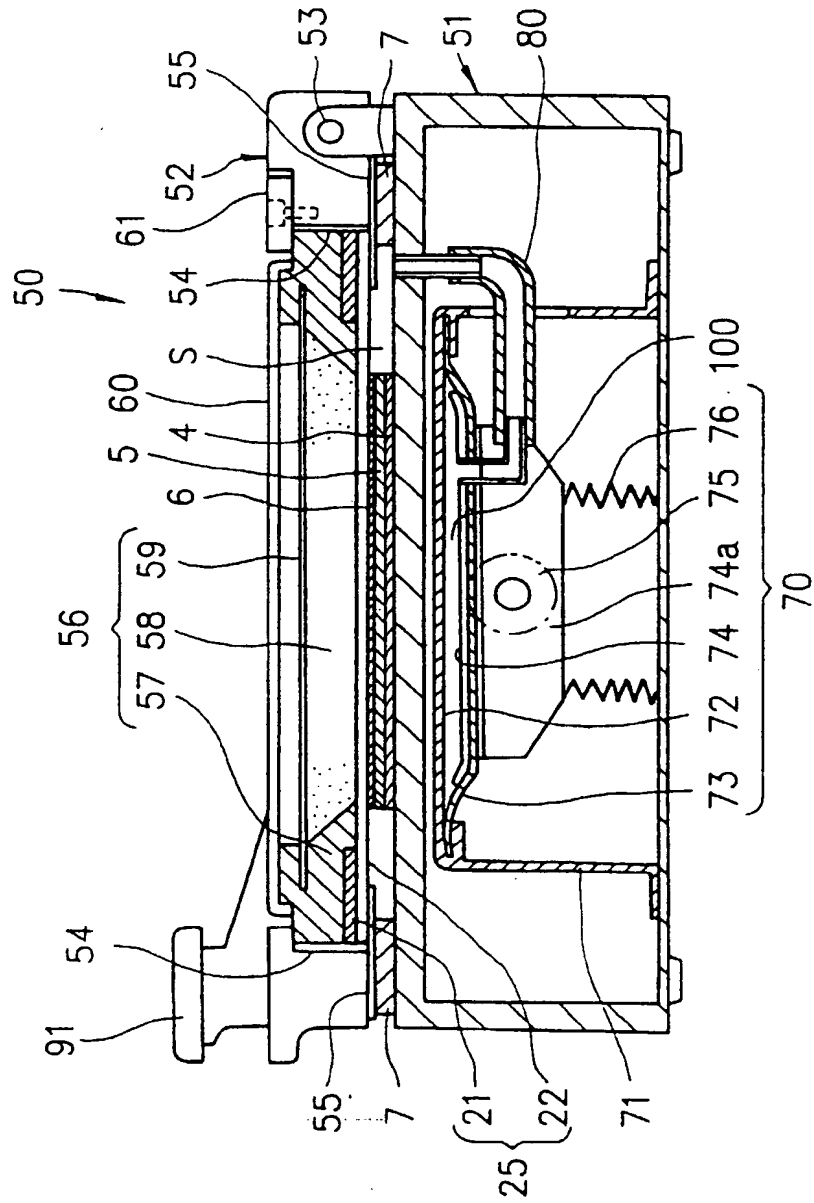


FIG. 8





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EUROPEAN SEARCH REPORT

Application Number
EP 99 30 2873

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
P,A	EP 0 842 770 A (RISO KAGAKU CORP) 20 May 1998 (1998-05-20) * the whole document *	1	B41L13/02 B41F15/02
D,A	EP 0 615 842 A (RISO KAGAKU CORP) 21 September 1994 (1994-09-21) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			B41L B41F
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 14 July 1999	Examiner Madsen, P
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